Physico-Chemical Analysis of Ground Water Samples in Dholpur District, Rajasthan, India

A Synopsis

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INTRODUCTION

Water is extremely essential for survival of all living organisms. The quality of water is vital concern for mankind since it is directly linked with human welfare. In India, most of the population is dependent on groundwater as the only source of drinking water supply. The groundwater is believed to be comparatively much clean and free from pollution than surface water. But prolonged discharge of industrial effluents, domestic sewage and solid waste dump causes the groundwater to become polluted and created health problems. The problems of groundwater quality are much more acute in the areas which are densely populated, thickly industrialized and have shallow groundwater. The rapid growth of urban areas has further affected groundwater quality due to overexploitation of resources (Patil and Patil, 2010*)* and improper waste disposal practices. Hence, there is always a need for and concern over the protection and management of groundwater quality.

It is important to know the quality of groundwater because it is the major factor which decides its suitability for domestic, agriculture and industrial purposes (Raju, *et al*, 2009).
The importance of groundwater as a fresh water source for drinking, industrial and domestic purposes is growing in most parts of world. Water scarcity is one of the major challenges in the environment which has resulted in the continent's underdevelopment, lack of safe drinking water and adequate sanitation. Fresh water makes up only about 2.5% of the total global water resource and the remainder is saltwater (Ranjan , *et al*., 2006).

Suitability of water for various uses depends on type and concentration of dissolved minerals and groundwater has more mineral composition than surface water (Mirribasi *et al.*, 2008).

The population use alternative groundwater sources which are well and springs. The groundwater sources degrading gradually due to urbanization. So that, there is more concern to make drinking water pure, safe, healthy and odourless (Sharma *et al.,* 2005).

Every 8 seconds, a child dies from water related disease around the globe, 50percent of people in developing countries suffer from one or more water related disease and 80 percent of diseases in the developing countries are caused by contaminated water (Jagadeesh, 2010).

A systematic study of correlation and regression coefficients of the water quality parameters not only helps to assess the overall water quality but also to quantify relative

concentration of various pollutants in water and provide necessary for implementation of rapid water quality management programmes. (Kumar and Sinha , 2010).

In the most part of our country ground water is a major source of drinking water, Groundwater in several parts of India is affected by arsenic and Fluoride pollution due to the geo-genic contamination and anthropogenic pollutions (CGWB, 2010). The rapid growth of urban areas has further affected the groundwater quality due to over exploitation of resources and improper waste disposal practices (Raja and Venkatesan, 2010).

STUDY AREA

Dholpur is a newly formed district of Rajasthan, carved out of Bharatpur district. It is bound on the north-east by Agra district of Uttar Pradesh, on the south by Morena district of Madhya Pradesh, on the west by Sawai Madhopur district and on the north by Bharatpur district of Rajasthan. It covers 0.89 percent area (3034 sq.kms) of the State. It is situated at the north-east border of Rajasthan, Dholpur district was formed in 1982 by merging 4 former tehsils of district Bharatpur – Dholpur, Rajakhera, Bari and Baseri. Agra-Mumbai national highway cuts through the district, which is located 109 km from Bharatpur, 54 km from Agra and 50 km from Gwalior. Dholpur is a junction of the Central Railways and is served by regular bus services of the Rajasthan, Madhya Pradesh and Uttar Pradesh roadways.

The district covers an area of 3, 033 square kilometers and is at a height of 183 meters above sea level. It has 5 sub-divisions, 5 tehsils, 4 panchayat samitis and 3 municipalities. There are 153 gram panchayat and 802 villages in the district. Baseri Tehsil has 196, Bari 171, Dholpur 193, Rajakhera 114 and Sepau has 128 villages. Keeping Dholpur as a central point, Rajakhera is located in the east, Bari is in the north and Baseri is in the north-west with the Dang area in the South-west. The district has many geographical variations and each tehsil has its own characteristics. Bari and Baseri are both Meena dominated areas, whereas the Dang area towards the south-west is dominated by Gujar's. This area is rocky and particularly rich in minerals, and also has many mines and quarries. Both Rajakhera and Dholpur, in parts of which the Chambal flows, have comparatively plain topography and a good soil base for agriculture.

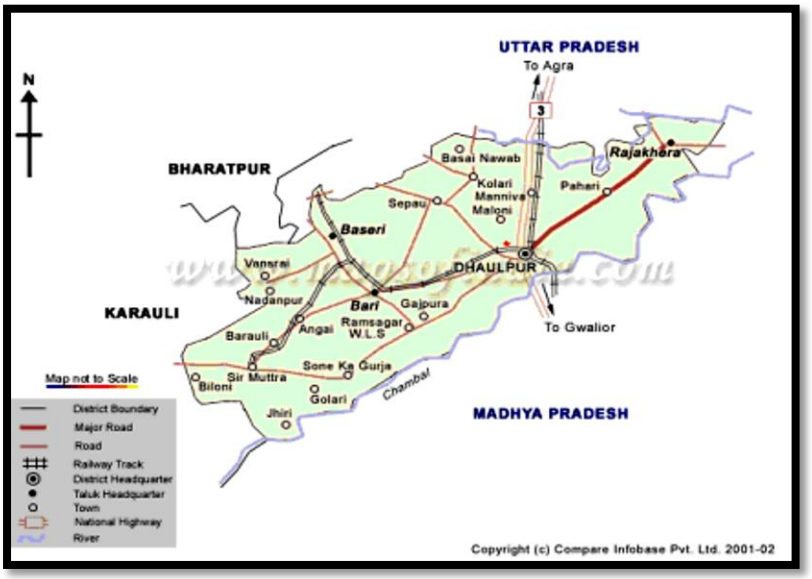

Fig 1: Map of Dholpur district (Rajasthan)

Dholpur has a dry climate, facing extremes of summer and winter. The monsoon hits the district in July and lasts till mid-September. It is difficult to find reasons but the rainfall of the district observes a continuous decline during the last decade. Such a decline could be part of a medium term cycle in precipitation, but it has significant impact on certain variables with the workforce an assessment of which was made in the census 2001.

There is one perennial river, the Chambal, in the southeast of the district and a seasonal river in the north-west, the Parvati. Other small seasonal rivers and the village ponds are the irrigation sources here. There is an irrigation dam on the Parvati, too. The 2 lakes situated in Dholpur town – Ramsagar and Taalabshahi – are also utilized for irrigation.

Over half of the cultivated area in Dholpur is irrigated, most of it from groundwater. In the year 2003, 107 thousand hectares of the area was irrigated. Groundwater provided irrigation support for 94.6 thousand hectares while another 9 thousand hectares were irrigated from the surface water sources.

RESEARCH OBJECTIVES

The study aim to determine the quality of water in Dholpur district area in order to evaluate their suitability for drinking and domestic purpose.

The objectives of proposed work are:

1. Collection of different water samples from different blocks & seasons.
2. To determine the physical and chemical parameters of collected water samples in different seasons & blocks.
3. To compare the physical and chemical parameters with their standards.
4. To analyze the correlation among physical and chemical parameters of water.
5. To analyze the impact of independent variables on dependent variables.

REVIEW OF LITERATURE

Various researcher in our country have carried out extensive studies on Water Quality (Abbasi *et al.*, 2002 and Jagdap *et al.*, 2002) have studied water quality of different rivers. Shriniwas *et al.*, 2000 and Jha *et al.*, 2000) studied water quality in Hyderabad and Bihar, respectively. Patnaik et al., 2002) reported water pollution in industrial area. The main objective of the scientific investigations is to determine the hydrochemistry of the ground water and to classify the water in order to evaluate the water suitability for drinking, domestic and irrigation uses and its suitability for municipal, agricultural and industrial use.

Water is an elixir of life. It is an important component to human survival. Water should be purified for a better life style. It is the basic duty of every individual to conserve water resources (Jothivenkatachalam *et at.*, 2010). Drinking water quality is affected by the presence of different soluble salts (Sonawane and Khole, 2010). Water Quality is based on the physical and chemical soluble constituents due to weathering of parent rocks and anthropogenic activities (Akinbile and Yusoff, 2011).

The correlation coefficient is a helpful tool for the promotion of research in water pollution problems. Groundwater quality is analyzed for its physical, chemical and biological parameters which are closely interlinked. All the research work so far carried out on groundwater quality in different place of Yemen is largely based on chemical and physical analysis (Metwali, 2003); (Atta and Razzak, 2008).

Reddy and Reddy (2011) carried out the study on Physicochemical analysis of surface and groundwater of selective areas of UCIL Thummalapalli. He studied various parameters like pH, EMF, electrical conductivity, salinity, DO, and TDS. By observing the result, it was concluded that parameters were below the pollution levels which satisfy the requirement for the use of various purposes like agricultural, domestic and Industrial etc. It has been explained the excessive salinity in groundwater affects the productivity of land and lower salinity levels can adversely affect vegetation growing in areas of shallow water.

Colour of natural water is due to mainly to organic matter which originates from soil, peat and decaying vegetation. In addition, inorganic iron and manganese are present in some groundwater and surface water and many impart a red and black colour respectively. Discoloration

of potable water may arise from the dissolution of iron (red) or copper (blue) in distribution pipes, which can be enhanced by bacteriological processes. Microbiological action can also produce "red water" resulting from the oxidation of iron (II) to iron (III) by "iron bacteria". Similarly black discoloration may result from the action of bacteria capable of oxidizing dissolved manganese to give insoluble forms. Furthermore, colour producing organic substance can react with chlorine to produce undesirable levels of chlorination byproduct (WHO, 1996).

According to Shyamala *et al.*, (2008) water quality parameters have been analyzed like- pH- measured using standard pH meter, total dissolved solids (TDS) by standard methods 3, calcium content by EDTA titrimetric method, chloride content by argentometric method, total hardness (TH) by EDTA titrimetric method, methyl orange alkalinity and chemical oxygen demand (COD) by open reflux method. The simple linear correlation analysis has been carried out to find out correlation between any two tested parameters.

Bishnoi and Malik (2008) analyzed the physicochemical parameters of groundwater at 41 different locations in Panipat city (Haryana). The data showed the variation in water samples with respect to chemical composition and correlation coefficient analysis has been adopted among different water quality parameters. Finally it has been concluded that higher values of certain inorganics may be due to geological reasons, unplanned sewage and dumping of solids etc.

Ramakrishnaiah *et al.*, (2009) assessed the water quality index (WQI) for the groundwater of Tumkur taluk, Karnataka, India. The study was carried out by collecting groundwater samples from the different locations and subjecting the samples to a comprehensive physicochemical analysis. For calculating the WQI, the following 12 water quality parameters have been selected- pH, total hardness, calcium, magnesium, bicarbonate, chloride, nitrate, sulphate, total dissolved solids, iron, manganese and fluorides. The results of analysis have been revealed that the groundwater of the area needs some degree of treatment before human consumption, and it also needs to be protected from the perils of contamination.

A survey of the literature on "Physico-chemical Analysis of the Groundwater" reveals that there is always a need of monitoring the quality of drinking water and also concern over the proper treatment, protection and management of the groundwater as it is the most important source of the drinking water.

METHODOLOGY

The work will be followed in the following sequences-

1. At first, ground water sample of the specified areas will be collected in different seasons. Then after; its temperature variation will be recorded.

2. Of the aforesaid sample, some data will be obtained on the basis of the apparatus in our departmental laboratory e.g. temperature, pH, conductivity, turbidity, TDS (total dissolved solids), TS (total solids), fluoride, total hardness, COD & BOD etc.

3. Some data which is expected to get and apparatus are not available in our laboratory, for that along with the collected sample will have to go to any higher standard laboratories like Physical and chemical laboratories of IIT Delhi, Kanpur, EPCB, Jaipur and NEERI, Nagpur etc.,
    a. e.g. An instruments like NMR, AAS, Colorimeter will be required for the analysis Arsenic, Zinc, cadmium and other heavy metals which is not available in our departmental laboratory.
4. Results will statistically analyze with the help of SPSS software.
5. The suitability of groundwater for drinking and other purpose will be assessed by comparing physical and chemical parameters of the study area with the guidelines recommended by World Health Organization (WHO), Indian Council of Medical Research (ICMR), Bureau of Indian Standards (BIS) and United States Public Drinking water Standards (USPH) etc.
6. Results will also analyze with correlation and regression of parameters.

REFERENCES

Abbasi SA, Khan FI, Sentilvelan K and Shabudeen A (2002). Modelling of Buckingham Canal Water Quality. Indian J. Environ. Health, Vol. 44(4), pp: 290–297.

Akinbile CO, and Yusoff MS (2011). Environment impact of leachate pollution on groundwater supplies in Akure, Nigeria. International Journal of Environmental Science and Development, Vol. 1 (1), pp: 81-89.

Atta, AI and Abdul Razzak ABI (2008). Chemical and physical analysis of some ground water sample in Al-Quti wells Hodiedah, Yemen. Journal of the Iranian Chemical Research, Vol. 1, pp: 141-144.

Bishnoi M and Malik R (2008). Groundwater quality in environmentally degraded localities of Panipat city, India. Journal of Environmental Biology, Vol. 29 (6), pp: 881-886.

CGWB, (2010). Central Ground Water Board of India Groundwater quality in Shallow aquifers of India.

Guru Pratap Reddy P and Subha Reddy GV (2011) Physico-chemical analysis of surface and groundwater of selective areas of UCIL Thummalapalli project, YSR (KADAPA),AP, India, African Journal of Scientific Research Vol.3 No.1,pp-164-176.

Jagadeesh A (2010). Safe drinking water for all through solar disinfection, Journal of Rural Development, Vol.58 (7), pp: 11-13.

Jagdap J, Kachawe B, Deshpande L and Kelkar P (2002). Water Quality Assessment of the Purna River for Irrigation Purpose in Buldana District, Maharashtra. Indian J. Environ. Health, Vol. 44(3), pp: 247–257.

Jha AN and Verma PK (2000). Physico–chemical property of drinking water in town Area of Godda district under Santal Pargana, Bihar. Pollution Research. Vol. 19(2), pp: 245–247.

Jothivenkatachalam K, Nithya A and Chandra Mohan S (2010). Correlation analysis of drinking water quality in and around Perur block of Coimbatore District, Tamil Nadu, India. Rasayan Journal Chemistry, Vol. 3(4), pp: 649-654.

Kumar N and Sinha D K, (2010). Drinking water quality management through correlation studies among various physicochemical parameters: a case study. International Journal of Environmental Sciences, Vol.1(2), pp: 253-259.

Metwali RM (2003). Water quality of some wells in Taiz city (Yemen Republic) and its surroundings. Folia Microbiology, Vol. 48(1), pp: 90-94.

Mirabbasi R., Mazloumzadeh SM and Rahnama MB (2008). Evolution of irrigation water quality using fuzzy logic. Research Journal of Environmental Sciences, Vol. 2 (5), pp: 340-352.

Patil VT and Patil PR (2010). Physicochemical analysis of selected groundwater sample of Amalner town in Jagaon district, Maharashtra, India. Electronic Journal of Chemistry, 7(1), pp: 111-116.

Patnaik, KN, Satyanarayan SV and Poor RS (2002). Water Pollution from major industries in Pradip Area-A Case study. Indian J. Environ. Health, Vol. 44(3), pp: 203- 211.

Raja G and Venkatesan P (2010). Assessment of Groundwater Pollution and its impact in and around Punnam Area of Karur District, Tamilnadu, India. E-Journal of Chemistry, Vol.7 (2), pp:473-478.

Raju NJ, Ram P and Dey S (2009). Groundwater Quality in the Lower Varuna River Basin, Varanasi District, Uttar Pradesh. Journal of the Geological Society of India, Vol. 73(2), pp: 178-192.

Ramakrishnaiah CR, Sadashivaiah C and Ranganna G (2009). Assessment of water quality index for the groundwater in Tumkur Taluk, Karnataka state, India. E-Journal of Chemistry, Vol.6 (2), pp: 523-530.

Ranjan SP, Kazama S and Sawamoto M (2006). Effects of climate and land use changes on groundwater resources in coastal aquifers. Journal of Environmental Management, Vol. 80(1), pp: 25-35.

Sharma JD, Sharma P, Jain P and Sohu D (2005). Chemical Analysis of Drinking Water of Sanganer Tehsil, Jaipur District. International Journal of Environmental Sciences and Technology, Vol.2 (4): 373-379.

Shyamala R et al., (2008). Physico-chemical analysis of bore well water samples of Telungupalayam area in Coimbatore district, Tamilnadu, India. E. Journal of Chemistry, Vol.5 (4), pp: 924-929.

Sonawane VY and Khole AM (2010). Water quality of some drinking waters in Parbhani city: a case study. Journal of Chemical Pharmaceutical Research, 2(5), pp 104-107.

Srinivas CH, Tiska RS, Venkateshwar C, Satyanarayan Rao MS and Reddy RR (2000). Studies on Ground Water Quality of Hyderabad. Pollution Research, Vol. 19(2), pp: 285–289.

WHO (1996) guidelines for drinking water quality. 2nd edition. Recommendation. World Health organization Geneva, 1, pp 30-113.